MULTIMEDIA UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 2, 2016/2017**

## DCS5068-DATA STRUCTURE & ALGORITHMS

(DIT)

11 MARCH 2017
2.30 pm – 4.30 pm
(2 Hours)

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**INSTRUCTIONS TO STUDENTS**

1. This question paper consists of **5** pages and **2** sections.
2. **SECTION A**: Answer **ALL** questions on the OMR sheet provided.
3. **SECTION B**: Answer **ALL** questions in the answer booklet provided.

## SECTION A (20 Marks)

***Instruction:*** *Please mark* ***A*** *for TRUE statement or* ***B*** *for FALSE statement on the OMR sheet provided.*

1. A stack is a sequence of items, which can be added and removed from one end only.
2. In the stack operations, "pop" is a function to insert a new element into stacks.
3. Linked list is a collection of memory address.
4. In the linked queue, there is operation called "Check Full" to ensure the queue is not full before adding a new element.
5. A linked list uses non-contiguous memory locations and hence requires each node to remember where the next node is located.
6. In the linked list, delete an item in the middle node will require to consider the previous node.
7. Stack is being used to convert non recursive algorithms to recursive algorithms.
8. The operation to remove the top element of the stacks is called "destroyStack".
9. Remove all parentheses is one of the rule of transformations between infix to postfix.
10. Stack element is within the same data type.
11. A stack can be implemented easily using an array and an integer that holds the position of the top element.
12. In a node structure, data is to store address of the next node.
13. In the queue, first item placed on queue will be the last item to be removed.
14. A list is a sequence of elements.
15. Declaration of *int data [10]*; means memory can store up to 10 elements.
16. Each node contains a data along with information of the next node is called linked list.
17. Infix is when the operand comes between the operators.
18. Linked stack is empty when the rear pointer is null.
19. Two main operations of linked stack are push and pop.
20. Linked queue is empty when the top pointer is null.

**Continued ...**

## SECTION B (80 Marks)

***Instruction:*** *Answers all questions in the answer booklet provided.*

### QUESTION 1

a) What is the output of the following code? (2 marks)

```
#include <iostream>
using namespace std;
int main()
{
   char *ptr;
   char Str[] = "abcdefg";
   ptr = Str;
   ptr += 5;
   cout << ptr;
   return 0;
}
```

b) Write a full C++ program based on the sample output screen and requirements given below. (18 marks)

- Create a structure called *Library*. The data members are:
  - *Name* : string
  - *ID* : int
  - *Unit* : int
  - *Price* : double
- In *main()* function,
  - Ask user to enter number of book.
  - Create a dynamic array of structure *Library* (array size equals number of book).
  - Using a *for* loop, prompt the user to enter *Name, ID, unit* and *price*.
  - Display the *Name, ID, unit* and *price* entered by user.

**Sample Output:**

```
Enter the number of book:2
Book Name:Alladdin
Book ID:56965
Unit:2
Price:99.00
Book Name:Cinderella
Book ID:55489
Unit:4
Price:86.00
You have entered these info:
Name              ID    Unit Price
Alladdin         56965  2    99.00
Cinderella       55489  4    86.00
```

**[Total 20 marks]**

**Continued ...**

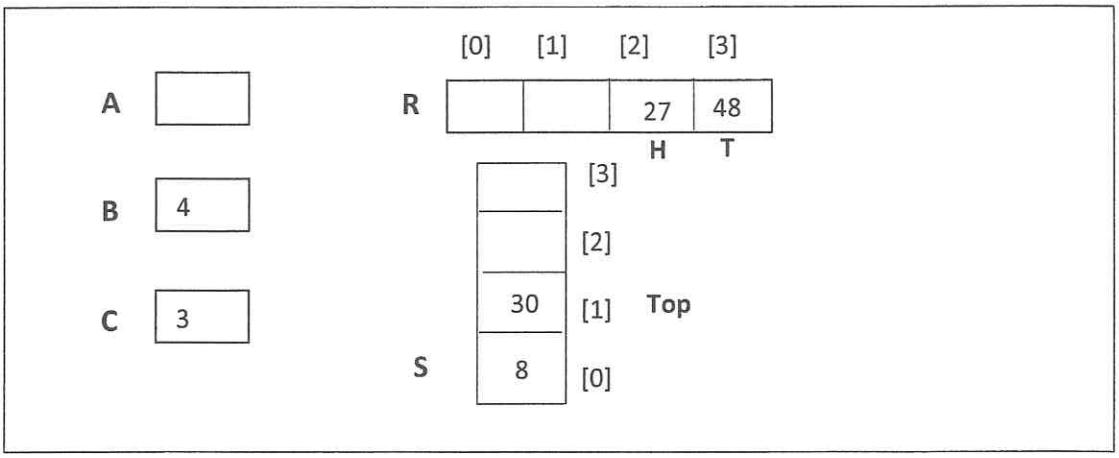
## QUESTION 2

a) Given the values of integers **A, B, C** and **D** are **20, 5, 8, 11** respectively. Calculate the value based on the following expressions below.

i. A B D + * C - (2 marks)

ii. A B – C D * B / + (2 marks)

b) Suppose ***R*** is a cyclic queue of integers with four elements and ***S*** is a stack of integers with four elements. There are 3 integers ***A, B, C*** and 3 pointers ***H, T*** and **Top** are declared. Draw a sequence diagrams of ***R, S, A, B*** and ***C*** after each of the following instructions.




i. `R.append (B * C);` (1 mark)

ii. `A = S.pop( );` (2 marks)

iii. (3 marks)

```
if (( B * C) < R.serve())
 {
      C= S.pop ( )/2;
}
```

vi. (3 marks)

```
for (int i = 0; i<2; i++)
{
     if ( R.serve( ) == 12)
     {
          C++;
     }
}
```

**Continued ...**

c) Complete the program given below. This program is to create a linked list of n nodes where the new node will be added to the end of the linked list. Each node's data is obtained from the user. **[Refer to sample output screen]** (7 marks)

```
#include <iostream>
using namespace std;
struct node
{
      int data;
      node *next;
};
main ()
{
      node *head, *temp, *current;
      int i, num, n;
      cout << "Enter list size: ";
      cin  >> n;
      -------Q1c(i)------
      -------------------
      -------------------
      cout << "\nLinked list created.\n";
}
```

**OUTPUT SCREEN**

```
Enter list size: 5
Enter data : 10
Enter data : 8
Enter data : 16
Enter data : 9
Enter data : 11
Linked list created
```

**[Total 20 marks]**

**Continued ...**

## QUESTION 3

a) By using binary search, show step by step on how to find the target **48** in the data **16, 45, 8, 90, 33, 67** and **48**. The following are the variables declared in the binary search algorithm. **[Hint: Sort the data]** (9 marks)

```
int table [7], target, first, last, mid;
```

| **Integer** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Index** | [0] | [1] | [2] | [3] | [4] | [5] | [6] |

b) Write a function definition for the key **364897** that truncated the first **3** digits and last digit. The function will return the result. (5 marks)

c) Given an array that contains the elements as shown in the diagram below, sort the sequence of numbers in **descending order** by using **Selection Sort**. (6 marks)

| 24 | 56 | 47 | 35 | 10 | 90 | 82 |
|---|---|---|---|---|---|---|

**[Total 20 marks]**

## QUESTION 4 [20 marks]

a) Based on the nodes given below:

**56, 63, 40, 32, 38, 45, 15, 59, 75, 100, 60, 61**

i. Draw a binary tree. (6 marks)

ii. Based on the answer in **(i)**, delete the node **63**. (2 marks)

b) Based on the structure of node given below, write a function for PreOrder traversal. (5 marks)

```
struct node
{   int data;
    node *left
    node *right
}
```

c) Consider the following specification of a graph G:

V(G) = { 1,2,3,4,5,6 }

E(G) = {(1,1), ( 1,2 ), ( 1,5 ), ( 2,3 ), ( 2,4 ), ( 3,6 ) ,( 4,1 ) , (4,5), (6,4), (6,6)}

i. Draw an undirected graph. (4 marks)

ii. Draw its adjacency matrix. (3 marks)

**[Total 20 marks]**

**End of Page.**